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Robert.P.Ewing@fakeaddress.net on 09/17/2001 08:24:07 AM

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IP address: 129.186.26.198

---> Commentors Name: Dr. Robert P Ewing
---> Organization: Iowa State University
---> Position: Staff Scientist

---> The Commentors Address:
---> Department of Agronomy
---> Ames, Iowa 50011-1010

---> Email Information:
---> ewing@iastate.edu
---> Add commentor to the mailing list : yes

---> Contact Information:
---> fax number : 515-2943163
---> phone number : 515-2947856
---> organization : Iowa State University
---> position : Staff Scientist

--> Comment Text :
To whom it may concern:

Comments on Yucca Mountain as a potential repository for Radioactive Waste, in response to the recently released Preliminary Site Suitability Evaluation.

1) I have two concerns about the management of the Yucca Mountain Project:

A. I have worked with some of the scientists at LBNL, and I know that they understand the impact and importance of what they are doing. I have been impressed by the dedication and imagination they bring to bear, making conservative assumptions to test every aspect of repository performance. However, there is surely tremendous pressure on the project management to declare Yucca Mountain a viable repository. The desire the "get the right numbers", to "make the project work", surely trickles down to put pressure on

the scientists, too. A potential consequence is that concerns raised by the scientists may not be given a fair hearing at the decision-making levels. Notice that I have no evidence, and this is not a specific complaint; this is "armchair reasoning," as it were.

B. Because the research is necessarily limited in time and money, there is also pressure on management to push the process forward. But science, being a process of exploration, is not necessarily linear. For example, the "drift shadow effect," which reduces the saturation of the rock at the bottom of the emplacement drifts, was only "discovered" and used in models relatively recently in the site characterization process. It is now effectively YMP dogma that the drift shadow effect exists. But what about more recent discoveries and/or concerns? The need for science to pursue all reasonable avenues, naturally conflicts with the desire of management to get out a final product within budget and schedule, and management pressures can effectively lock out new but important avenues of exploration. Again, I am making no specific complaints, but simply raising this issue for consideration.

2) I have several concerns about the state of our current scientific knowledge of the site. I speak both as a researcher in unsaturated zone hydrology, and as someone who has worked briefly on the YMP.

A. The second Heater Test has not been completed, and there is to date no serious evaluation of how the combined stresses of excavation and intense heating will affect the hydraulic properties of the surrounding rock. However, seepage into the drift is sensitive to the size of fracture openings, which is likely to be sensitive to excavation and heating stresses. Simply put, thermally stressed rock may show more seepage than unstressed rock. Given this uncertainty concerning a critical aspect of site performance, it seems premature to proceed with a site recommendation.

B. Understanding of colloid-mediated transport at the site is sketchy at best. However, given that escaping radioactive waste is generally in a form that strongly sorbs to the fracture walls, colloid-mediated movement provides the "best" or fastest route for radionuclide movement. The absence of any firm scientific knowledge about how and to what extent this pathway might operate at the site again suggests that site recommendation is premature.

C. It has been accepted dogma since at least Neretnieks (1980) that diffusion of radionuclides from fracturess into and out of the rock matrix is a major retarder of transport in fractures. Recent investigations have raised doubts about this. Work this summer (2001) by Max Hu (LBNL) and me suggests that, because of low connectivity between the pores in welded tuff, much of the porespace that is accessible to diffusing radionuclides dead-ends relatively near the fracture face. The consequence of this will be to maintain matrix radionuclide concentrations near the fracture face higher than predicted, but with less matrix retardation than predicted in standard models. The precise reduction in retardation is very sensitive to the actual (local) pore connectivity, and we've not had time to finish modeling; however, this again seems a critical aspect of system performance that is not currently well understood.

D. Fracture networks, which are recognized as carrying the vast majority of

moving water at Yucca Mountain, are notoriously poorly understood. We do know, however, that they are very sensitive to small changes in boundary conditions. A small increase in head, for example, might shift much of the flow from one network complex to another, with the consequence of wetting some previously dry areas and drying some previously wet. The likelihood of some incipient climate change, with accompanying changes in meteorological upper boundary conditions for the site, suggests that current fracture flow conditions may bear little or no resemblance to those in the near future.

E. Current models of water and contaminant flow in Yucca Mountain are essentially steady-state continuum models, with little or no sensitivity to the transient nature of the boundary conditions and the resulting fracture flow. I recognize that modeling 1,000,000 years of transient flow is a serious obstacl1 However, it is unlikely that the long-term behaviors of transient and steady-state processes (or models) will converge, given the number of characteristic times and time-dependent processes involved. For example, if the driving force is roughly yearly water flushes down the fractures, then some attention should be paid to the impact of year-scale processes: differences may accumulate rather than being averaged out over 100,000 years or more.

F. I have heard conflicting reports about the detection of bomb-pulse 36Cl deep inside Yucca Mountain. First there reports that it was found, then that it was a mistake or a poor measurement, but some people tell me it was real. Given the potential implications if such were actually found, I recommend that 1) a team completely independent of YMP investigate, resample, and re-analyze for the presence of this isotope, and 2) if it is found, models of repository performance be deemed unacceptable unless they also predict transport of 36Cl from the surface to the ESF within 50 years. If this isotope is indeed detected but current models deny that possibility, further work with these models is clearly an exercise in futility and self-deception.

In conclusion, I feel that endorsing Yucca Mountain now, in our current state of ignorance and uncertainty, is premature.

Sincerely,

Dr. Robert P. Ewing

Soil Scientist, Iowa State University

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